Syo KUROKAWA*: New or noteworthy species of *Parmelia* of Japan

黒川 逍*: 日本産ウメノキゴケ属の新種および稀種

Although the genus *Parmelia* of Japan has been well studied by various authors, some more tropical species of the genus will be found in southern Japan and boreal species in northern Japan in the future. In addition, some new species of the genus, though probably only a few, will also be described from Japan. In this paper, three species of *Parmelia* will be reported as new members of the lichen flora of Japan and one will be described as a new species. Of these species, *Parmelia eciliata* (Nyl.) Nyl. and *P. imbricatula* Zahlbr. belong to tropical species, but *P. sulcata* Tayl. to boreal species. The new species represents the pustulate counterpart species of *P. galbina* Ach. and probable line of speciation of the *P. galbina* group is also discussed in this paper.

Parmelia eciliata (Nyl.) Nyl. in Fournier, Mex. Pl. 3. 1872.

Basionym. *Parmelia crinita* var. *eciliata* Nyl. in Flora **52**: 291, 1869.

This species resembles *P. crinita* Ach., which is also known from Japan. They both have similar thalli, cilia, imperforate apothecia, and large spores and produce atranorin, stictic acid, and constictic acid. However, *P. eciliata* is not isidiate at all, while *P. crinita* is isidiate on the uppersurface as well as along the margin of lobes. It has been recorded from Central and South America, West Indies, and Africa (Hale, 1965), but not from Asia. However, this species is apparently widely distributed in deciduous forests, usually growing on twigs in open forests or on canopy branches, at elevation 1800 to 2600 m in Taiwan. In addition, Dr. S. Nakanishi collected a specimen of this species in western Japan. New to Japan and Asia.

Specimens collected in Japan and Taiwan. JAPAN: Prov. Aki: Mt. Kammuri-yama, Saiki-gun, elevation about 720 m. *S. Nakanishi 12406* (TNS and Herb. of Kobe Univ.). TAIWAN. Prov. Ilan (宜蘭縣): Mt. Nanfuta-san (南湖大山), elevation 2400-2600 m. *S. Kurokawa 1037* (TNS). Prov. Taitung

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(臺東縣): Bayu Lake (巴油池), elevation about 2200 m. *S. Kurokawa 2387* (TNS); Mt. Lachialachiaerh (拉戛拉戛爾山), elevation about 1800 m. *S. Kurokawa 2481* (TNS), *2482* (TNS), and *2484* (TNS).

Parmelia hayachinensis Kurokawa, sp. nov.

Thallus ad corticem *Cryptomeriae japonicae* adnatus, cinereo-glaucescens, irregulariter lobatus, 5-8 cm diametro; lobi sublineariter elongati, 1.5-3 mm lati, 160-180 μ crassi. Superficies superior leviter maculata, dense pustulata, pustulis saepe aggregatis, erumpentibus subsorediatisque, sed haud farinosis; medulla alba; superficies inferior nigra, dense rhizinata, rhizinis nigris nitidisque, simplicibus, ca. 0.5 mm longis; lobi margine subcrenati ciliatique, ciliis nigris nitidisque, simplicibus, ca. 0.2 mm longis. Cortex superior prosoplectenchymatus, ca. 25 μ crassus; stratum gonidiale ca. 50 μ crassum; stratum medullare 70-90 μ crassum, hyphae medullae cellulos sphaeroides interdum formates; cortex inferior niger, 10-15 μ crassus. Apothecia non visa.

Superficies superior K + sublutescens; medulla K + lutescens deinde rubescens, P + aurantiaco-rubescens; thallus atranorinum, acidum galbinicum, zeorinum et leucotylinum continens.

Typus. Japonia: Kadomaguchi, Mt. Hayachine, Prov. Rikuchu, ca. 970 m alt. Juli 25, 1967 *S. Kurokawa 67081*—holotypus in TNS.

This new species is apparently related to *P. galbina* Ach., *P. metarevoluta* Asah., and *P. obsessa* Ach. These species, together with *P. hayachinensis*, belong to subsection *Imbricaria*, section *Imbricaria*, subgenus *Parmelia* (Hale

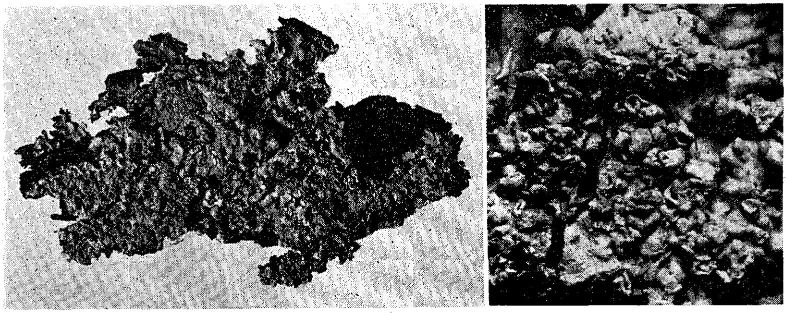

Fig. 1. *Parmelia hayachinensis* Kurokawa.
Left: holotype (×3/4). Right: uppersurface of lobes, showing pustules (×8).

& Kurokawa, 1964). They all contain atranorin, galbinic acid, zeorin, and other triterpenoides. They can be distinguished each other, however, by the presence or absence of vegetative reproductive organs; *i. e.*, *P. obsessa* has isidia, *P. metarevoluta* has soredia, and *P. hayachinensis* has pustules, but *P. galbina* lacks isidia, soredia, and pustules. These four species form a series of isidiate, sorediate, pustulate, and non-isidiate, sorediate, nor pustulate (abbreviated NISP) counterpart species. Medullary hyphae of these four species often form sphaeroidal cells, which are known only in these species, though about 600 species have been reported in the genus. Thus, the *P. galbina* group is very unique and distinct in the genus *Parmelia* from a viewpoint of morphology.

The geographical distribution of these four species is also very interesting. *P. galbina* shows a disjunctive distribution in Japan and eastern North America. Both *P. metarevoluta* and *P. hayachinensis* are known only from Japan, while *P. obsessa* has been reported only from eastern North America. In other words, sorediate, pustulate, or isidiate counterpart species are restricted to Japan or to eastern North America, while the NISP counterpart species is widely distributed and more common in both areas. Soredia, isidia, and pustules are vegetative diaspores proper to lichens and are composed of fungi and algae. Lichens with these vegetative diaspores, therefore, might have evolved or diverged from the NISP counterpart species, where fungi-algae association had been established. If lichens are evolving and diverging, though they are composite plants, the NISP counterpnrt species was the ancestral. In fact, *Parmelia* is a quite large genus, as mentioned above. Some species of the genus seem to be evolving and diverging or to have evolved or diverged recently. In the *P. galbina* group, *P. metarevoluta* (sorediate) and *P. hayachinensis* (pustulate) might differentiate from *P. galbina* (NISP) only in Japan and still have a restricted range, even though they have an advantage in propagation because of the presence of vegetative reproductive organs. On the other hand, *P. obsessa* (isidiate) might also diverge recently from *P. galbina* (NISP) only in eastern North America and still be restricted to there. *Anaptychia hypoleuca* (Mühl.) Mass. and *A. microphylla* (Kurok.) Kurok. (including f. *granulosa*) may represent another example of the same mode of speciation. *A. hypoleuca*, the NISP counterpart species, is distributed disjunctively in eastern Asia (Saghalin, Japan, Korea, Taiwan, and Yunnan) and eastern North America (Kurokawa, 1962). In contrast, *A. microphylla*, which has isidia (or isidial soredia in f. *granulosa*) along the margin of lobes, is known only from eastern Asia (Japan and Korea) (Kurokawa, 1962). It is apparently the isidiate counterpart species of *A. hypoleuca*. The isidiate counterpart species, *A. microphylla*, might differentiate from the NISP counterpart species within the range of the latter species and still be distributed only in a restricted area in eastern Asia.

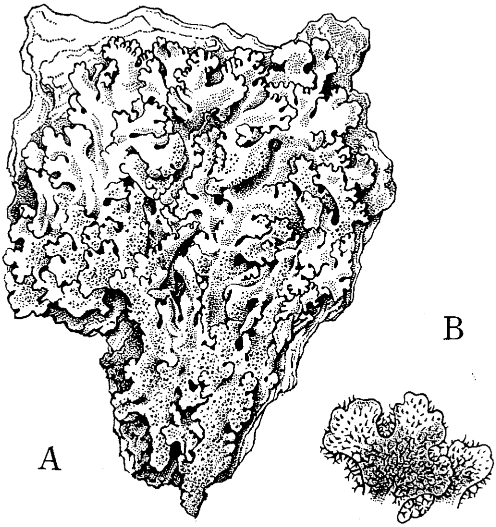

Fig. 2. *Parmelia imbricatula* Zahlbr. A: thallus (×1). B: undersurface of lobes, showing dichotomous rhizines (×3). Drawing by Mr. K. Arito.

At the present time, *Parmelia hayachinensis* is known only from the type locality in north-eastern Japan.

Parmelia imbricatula Zahlbr. Densk. Akad. Wiss. Math. Naturw. Wien **83**: 168, 1909.

Parmelia imbricatula is characterized by having dichotomous rhizines, isidia, and maculae and producing atranorin and barbatic acid. Although it has not yet been reported from Africa, *P. imbricatula* is one of the commonest *Parmeliae* in montane areas in tropics. This species is widely distributed and fairly common at elevation 800 to 1400 m in south-eastern Asia. It is not altogether, therefore, surprising to find this species in southern Japan.

Specimen collected in Japan. Kyushu. Prov. Hyuga: Wariiwa-dani, Sakatani-mura, Minami-Naka-gun. *S. Kurokawa 65063* (TNS).

Parmelia sulcata Tayl. in Mack. Fl. Hibern. 145, 1836.

Although *P. sulcata* is one of the commonest boreal species of *Parmelia*, being known from Europe, North America, and Siberia, it has not yet been recorded from Japan. From other species of the *P. saxatilis* group, it is easily distinguished by squarrosely branched rhizines, soredia, and fairy large marginal and laminal pseudocyphellae. In Japan, *P. sulcata* seems to be restricted to Hokkaido, where it usually grows on canopy branches of *Picea ezoensis* and probably other conifers.

Specimens collected in Japan. Hokkaido. Prov. Kushiro: Mt. Me-Akan, elevation about 580 m. *S. Kurokawa 65533* (TNS). Prov. Ishikari: Furebetsu, Mt. Furano, elevation about 800 m. *S. Kurokawa 65361* (TNS).

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日本産ウメノキゴケ属に3新産種と1新種を加えた。*P. eciliata*（**トゲナシウメノキゴケ** 新称）は *P. crinita*（**トゲウメノキゴケ** 新称）と近縁であるが，裂芽をつけない。新種 *P. hayachinensis*（**ハヤチネウメノキゴケ**）は *P. galbina* に似ているが，パスチュールができる。ハヤチネウメノキゴケおよびその近縁種で粉芽をつける *P. metarevoluta* はともに日本特産であって，さらに，これら3種に近縁な *P. obsessa* は裂芽をつけ北米東部の特産である。これらの4種のなかで，無性生殖器官（粉芽，裂芽，パスチュール）をもたず日米両地域に分布している *P. galbina* は祖先型で，他の3種は日・米両方のそれぞれの地域で分化したと考え，地衣類における種の分化の可能性を考えてみた。*P. imbricatula*（**ヒュガウメノキゴケ** 新称）はアフリカ以外の熱帯に広く分布している。*P. sulcata*（**コフキカラクサゴケ** 新称）はカラクサゴケが裂芽をつけるのに対して，裂芽はなく粉芽をつけていて，目下日本では北海道産しか知られていない。